RACE**A**MERICA
T i m i n g   S y s t e m s

Model 2400 Series Timer S4

Four Lane Snowmobile Drag Timing System Owner's Manual

Rev F

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LIMITED WARRANTY

To the original purchaser of this RACEAMERICA product, RACEAMERICA warrants it to be in good working order for a period of ninety (90) days from the date of purchase from RACEAMERICA or an authorized RACEAMERICA distributor. Should this product malfunction during the warranty period, RACEAMERICA will, at its option, repair or replace it at no charge, provided the product has not been subjected to misuse, abuse, or alterations, modifications, and/or repairs not authorized by RACEAMERICA.

Any product requiring Limited Warranty service during the warranty period should be returned to RACEAMERICA with proof of purchase. If return of merchandise is by mail, the customer agrees to insure the product, prepay shipping charges , and ship the product to RACEAMERICA, Inc.,280 Martin Avenue, Unit #1, Santa Clara, CA 95050.

ALL EXPRESSED AND IMPLIED WARRANTIES FOR THIS PRODUCT ARE LIMITED IN DURATION TO THE ABOVE NINETY DAY PERIOD.

UNDER NO CIRCUMSTANCES WILL RACEAMERICA BE LIABLE TO THE USER FOR DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF, OR INABILITY TO USE, SUCH PRODUCT.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

PACKAGE COMPONENTS

Each TIMER S4 four lane drag package includes:

1 -TIMER S4 Console Unit
2 -PRO TREE 'Christmas' Trees
2 -Tree Base Units
4 -IR Beam Emitters
4 -IR Track Sensors
4 -Dual Beam IR Emitters for Start/Stage
4 -Dual Beam IR Sensors for Start/Stage
6 -Interconnect Cable Assemblies for
      Track Sensors
2 -Interconnect Cable Assemblies for
      Console to Tree
1 -Owners Manual

POWER REQUIREMENTS

You will need these additional items to operate your TIMER S4:

2 - 12VDC automotive battery
16 - AA Alkaline batteries
16 - D size flashlight batteries

PRODUCT SPECIFICATIONS

The following listing provides the designed performance specifications for the 2400 Series TIMER S4:

Start Lane Width	4 to 30 Feet
Finish Lane Width	4 to 50 Feet
ET Timer Capacity	up to 90.000 sec
RT Timer Capacity	up to 9.999 sec
Time Accuracy	0.001 seconds

Power Requirements:

2400A Tree Base	12VDC Battery
IR Beam Emitter	4 - AA Batteries
Dual Beam Emitter	4 - D Batteries

THEORY OF OPERATION

The 2400 Series TIMER S4 is a completely self contained race timing system made with the latest technology CMOS circuit components to provide a highly accurate autocross timing solution. The system contains an internal quartz crystal clock to maintain time accuracy and display of race results to one thousandth of a second.

Power is supplied to the timer console and track sensor components of the 2400 Series TIMER S4 by the 12VDC automotive batteries connected to the RED and BLACK alligator clips located in each PRO TREE tree base. An absolute minimum of 11.0VDC is required for reliable operation of the system. Under normal conditions, a properly charged battery will operate for more than an entire day of racing without requiring a recharge.

The Beam Emitters and Track Sensors operate on invisible (to the unaided human eye) Infra Red light. The coded light frequencies are constantly received by the Track Sensors until a car interrupts reception ('breaks' the beam).

The IR Beam Emitter to Track Sensor transmission operates on Line-of-Sight principles. This makes alignment of these units critical. Tips are provided to aid alignment on surfaces that are other than ideal. These units will operate over a wide range of conditions but should not be operated beyond the specification parameters (less than 4 ft or more than 50 ft).

Once the system is properly set up and aligned on the racing surface, the timer console will 'monitor' the track sensor each time a run is made.

SET-UP STEPS - TIMER S4

STEP 1 -

Familiarize yourself with the components pictured in this manual and how they interconnect. The Track Sensor Interconnect Cable is configured for connection between the starting line, the finish line and the timer console.

All connectors are keyed for proper orientation. The 12VDC battery is connected with the RED alligator clip to plus (+) terminal of the battery and the BLACK alligator clip to (-) terminal of the battery.

The free standing, battery powered Model 5040A/5040D/5154L/R IR Beam Emitters are placed on one side of the start line and finish line and the Model 5140C/5154L/R IR Track Sensors are placed on the other side of the start line and finish line. Each of the 5040A/5040D Beam Emitter and 5140C Track Sensor units are fully interchangeable with each other. The Track Sensor Interconnect Cables are keyed to match the start line and finish line track sensor, position identified at the track sensor end of the cable.

STEP 2 -

Identify the emitter/sensor placement at the start line and finish line. The lane width should be set between four (4) and fifty(50) feet. To help in determining initial Beam Emitter to Track Sensor alignment in larger track widths, use a string stretched between the beam emitter and track sensor or eyeball a straight line between units.

STEP 3 -

There are two cables connecting the console to the each of the Pro Tree trees and Track Sensors. Layout the Track Sensor Interconnect Cables on the track site as illustrated in the Wiring Diagram in this manual. The Track Sensor cable consists of three cables , one running from the console to the satrt and finishm lines, the second cable connects the start line electronics and the third cable connects the finish line electronics. The large round connector connects to the console and the smaller connectors (RJ11) connect to the Track
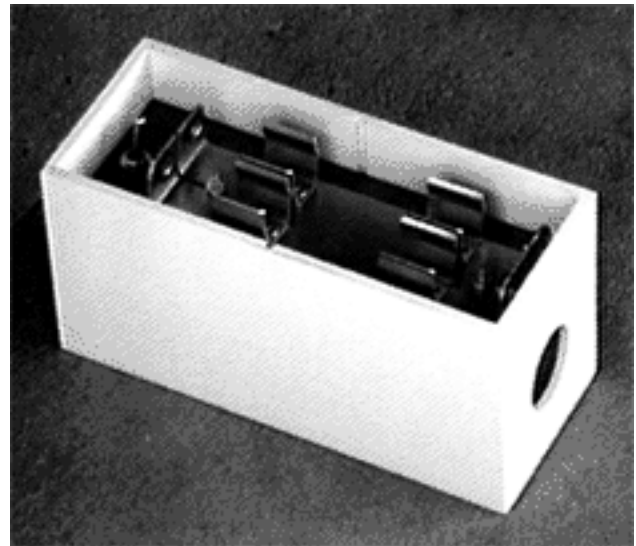
Model 5040A - IR Beam Emitter

Note On/Off switch and placement for four AA batteries for each Beam Emitter. All Beam Emitters are fully interchangeable with one another.
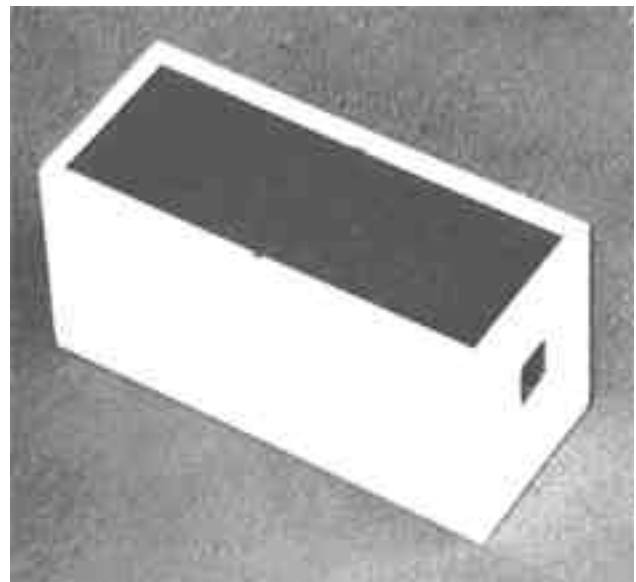
Model 5140C - IR Track Sensor

Note cable connector is located in the side facing away from the track. All Track Sensor are fully interchangeable with one another. Track Sensor is pictured bottom side up.

Sensors at the start line and the finish line as indicated on the cable near the RJ11 connector. Connect the Interconnect Cable to the Timer Console, then connect the start line and finish line cables and the Track Sensors for lanes 1&2 and lanes 3&4.

The Console to Tree Interconnect Cable connects between the electronics in the base of the tree and the console for lanes 1&2 and lanes 3&4. This is the cable with large connectors (RJ45) on both ends. This cable does not have a polarity and can be connected using either end to the console and tree electronics. Insure the cables are connected to the corresponding connector marked 1&2 or 3&4. Reversing these cables will cause the tree in lanes 1&2 to be connected to the sensors in lanes 3&4 and visa versa. Generally, there is a shorter start and finish line cable set and a longer length start and finish line cable set (as labelled on the cables). These are interchanmgable enabling the console to be positioned outside of lane 4 as shown or outside of lane 1.

STEP 4 -

Assemble the PRO TREE trees by placing the cable at the bottom of the tree into the top of the base. The cable slides through the round hole in the red top of the tree base and connects to the tree electronics. This connector is keyed and will only go in one way. Insert the tree into the red top of the base. Insure the threads on the bottom fitting mess with the threads of the base unit. Carefully spin the tree in a clockwise direction until the tree is snug in place. The tree should turn freely at all times. If the tree is difficult to turn, the threads may not be aligned properly and could cross thread and damage the fittings. If this happens, back the tree out of the fitting and try again making sure the tree is upright and not tilted slightly.

STEP 5 -

Connect the RED and BLACK alligator clips to the 12VDC batteries on both trees and you're ready to begin.

NOTE: When using timing equipment in areas with high electrical and radio interference or for longer track lengths, shielded cabling is strongly recommended to insure proper operation and accuracy. When shielded cabling is supplied, a single conductor wire is present at the console end of the cable marked 'External Ground Connection". When electrical interference is at very high levels, it may be necessary to connect the external ground wire to a water pipe or metal stake installed into the ground earth. Very high electrical interference will cause the alignment of the emitter/sensor pairs to appear to continuously count or randomly go in and out of alignment even when the sensor and emitter pair are aligned at close distances.

CABLING DIAGRAM
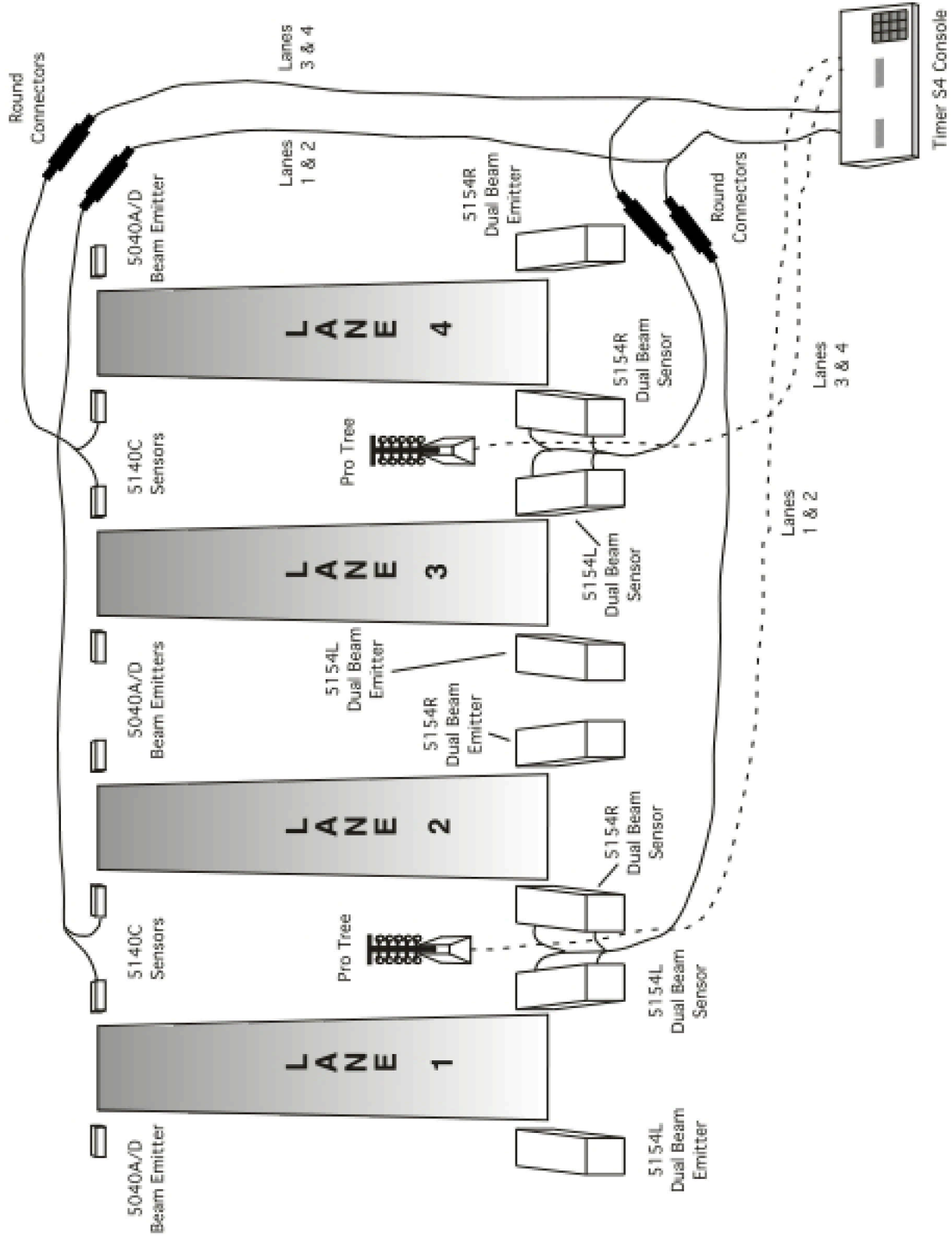
POWER ON/SELF TEST

Connecting the 12VDC battery in each PRO TREE tree base places the RACEAMERICA TIMER S4 into a selftest of the two microprocessors circuitry, the two LED displays (Light Emitting Diode) and the two PRO TREE Christmas trees. This is an internal test as well as a visual check of each display and tree. The LED Displays sequence through each segment of all four digits, then illuminates each segment and decimal point of all four digits until the number 8 is illuminated with the decimal point. The LED Display then places an 8 with decimal point in the far right digit and shifts the display to the left through all four digits.

The LED Displays then sequence through the PRODuct number, Serial Number of the unit, and the CODE revision level contained within each microprocessor. The LED Display then blanks out and each PRO TREE tree sequences through a lamp and circuitry test by illumiating the left red lamp and stepping up through the green and yellows on the left side, then on the right side. The trees then illuminate both top yellows and step down through each set of lamps for both lames. The final power-on self test is the lamp are all sequenced on starting with the red left up the left side, then the right re, up the right side. All ten lamps are then flashed once to conclude the self test. When both trees have completed the self test display, the system is fully functional and ready to run four lane drag racing.

ALIGNMENT MODE

To verify all Track Sensors are properly aligned with their Beam Emitters, the LED Displays enter into the Alignment Mode when the operator selects the Alignment Mode by pressing the **[0]** key on the Keypad. The LED Display momentarily indicates the position on each sensor on the display with letters represent each emitter/sensor pair **[SFSF].** The **[S]** indicates the START emitter/sensor pair, the **[F]** indicates the FINISH line emitter/sensor pair. The Status Display then changes each digit to a zero for each sensor being

monitored **[0000]**. If the Beam Emitter and Track Sensor are operating properly and aligned, the 0 digit will not change. If the Beam Emitter and Track Sensor are not properly aligned, the 0 digit for each emitter/sensor pair will count slowly if slightly out of alignment or continuously if they are not functioning properly or way out of alignment. Once the emitter/sensor pair are aligned properly, the digit will stop counting. If the alignment is off a little or intermittent, the digit for that emitter/sensor pair will count when they float out of alignment. Remember, the Beam Emitters and Track Sensors operate on a 'Line-of-Sight' concept and may require shims if they are installed on a street with a crown. Leaves, people, and other debris will also break the beams and could give false signals, so keep everyone and everything clear of the Beam Emitters and Track Sensor during racing activity.

To maximize the alignment of the emitter/sensor pairs, it is suggested to rotate the Beam Emitter slowly left and right until the alignment for that pair begins to count. This technique will determine the maximum lateral detection angle. Rotating the Beam Emitter up and down until the alignment starts counting determines the maximum vertical detection angle. Once these extremes are established, position the Beam Emitter in the center of the left/right detection angle and up/down detection angle. Repeat this same process with the other Beam Emitter and both Track Sensors. This will maximize the alignment accuracy.

At this point the timer is ready to time the first run. Press the **[#]** pound sign key to exit Alignment Mode.

RUNNING A RACE - 4 LANE

To begin racing, select the desired starting sequence (Pro or Full) by pressing the **[3]** key. This will toggle the starting sequence between the PRO format (all yellows then green at 0.400 second intervals) and the FULL or SPORTSMAN format (each yellow then green at 0.500 second intervals). To start a race, press the **[2]** key. The system will automatically check the alignment of

all sensors and emitters prior to starting the tree. If an emitter/sensor pair are out of alignment, the console will display **[SFSF]** in both LED Displays and flash the offending emitter/sensor pair. Pressing the **[0]** key will enter alignment mode and the problem can be corrected by re-aligning the emitter/sensor pair. If the alignments are all good after the **[2]** key was pressed, both Pro Tree trees will begin the starting lights sequence. If a driver interrupts the starting beam prior to the greem lamp illuminating in that lane, the starting sequence will stop for that lane freezing the tree and illuminating the red lamp indicating a redlight start in that lane. Once a driver crosses the starting line, they must cross the finish line to complete their run. The Pro Tree will continue to illuminate the red or green lamps until both lanes have crossed the finish line (or only one lane crosses the finish line in the case of a BYE run). When both vehicles cross the finish line for the same tree, the LED DIsplay for that tree will indicate the end of that pair of runs by displaying **[End]** and the Pro Tree JR will blank out until all runs are completed.

Once all four lanes have completed their runs, each PRO TREE tree will display the redlight conditions and the finishing order of each lane. The green lamp will be illuminated for the lane finishing in first place, the top yellow lamp in the lane finishing in second place, the middle yellow for the lane finishing in third place, and the bottom yellow for the lane finishing in fourth place. If a lane did not start or did not finish, the system will not score that lane in the finishing order and the tree will be blank for that lane.

The right LED Display will sequence through the four Elapsed Times displaying **[1 Et]** , then the elapsed time in seconds for lane 1, then **[2 Et]** followed by the elapsed time in seconds for lane 2, then **[3 Et]** followed by the elapsed time in seconds for lane 3, then **[4 Et]** followed by the elapsed time in seconds for lane 4. If a lane did not finish, the elapsed time is replace by **[.dnF]** for that lane. If a lane did not start, the elapsed time is replace by **[.dnS]** for that lane. The LED display will then sequence through the Reaction Times displaying **[1 rt]** , then the reaction time in

seconds for lane 1, then **[2 rt]** followed by the reaction time in seconds for lane 2, then **[3 rt]** followed by the reaction time in seconds for lane 3, then **[4 rt]** followed by the reaction time in seconds for lane 4. If a lane did not start, the reaction time is replace by **[.dnS]** for that lane. At this point the LED Display and the Pro Tree trees will blank out indicating the system is ready for the next run.

To recall the results for the last race, press the **[5]** key and the sequence above will repeat. These results are available for recall until the **[2]** key is pressed.

NOTE: When running a single run, the system will detect the end of the run and blank out the Pro Tree. The system requires the operator to press the **[#]** pound sign key to confirm the other tree is not being used. An example of this would be only lane 2 is being used and lanes 3 and 4 are not used. If, however, lane 2 and lane 3 are used, the system will detect both trees are being used and complete the run when both vehicles cross the finish line.

NOTE: As a general rule, if either Pro Tree has a green or red lamp illuminated after the race is over, the **[#]** pound sign key must be pressed by the operator to end the race as a safety precaution. If a race ends prematurely, a finish line sensor may have been bumped out of alignment after the start of the run. This would be indicated by a incorrectly low ET in one of the lanes.

RUNNING A RACE - 2 LANE

To operate the Timer S4 as a 2 lane timer, insert the Sensor Jumper Connector into the Track Sensor jack on the console of the two lanes not in use. If lanes 1 & 2 are connected to the track sensors, the Sensor Jumper Connector should be placed in the Track Sensor connector for lanes 3 & 4. The Pro Tree cable should be connected to lanes 1 & 2 in this example. No cable is connected to lanes 3 & 4 Pro Tree when only lanes 1 & 2 are being used. Operation of the Timer S4 is the same as 4-lane operation with the exception of pressing the **[#]** pound sign key is required after every race.

KEYPAD FUNCTIONS

1 ELAPSED TIME	2 RUN RACE	3 FULL/PRO SELECT
4 REACTION TIME	5 FINISH ORDER	6 PRINT TIMESLIP
7 TOTAL TIME	8 CONFIG PRINTER	9
★	0 ALIGN SENSORS	# ENTER

KEY 0

To check or monitor the alignment of the IR Track Sensors and Beam Emitters in all four lanes, press the **[0]** key to enter alignment mode. See the section on **ALIGNMENT MODE** earlier in this manual.

KEY 1

The Elapsed Time results form the last run are displayed. The left window will indicate the lane number while the right window will indicate the ET for that lane. Press any key to advance to the next lane.

KEY 2

See **RUNNING A RACE - 4 LANE** for instructions on the use of the **[2]** key to run a race.

KEY 3

Pressing the **[3]** key toggle the starting lights sequence from PRO mode to FULL or SPORTSMAN mode. The LED Displays on the console will confirm which starting sequence will be used. To toggle back to PRO sequence, press the **[3]** key again. Reapeated presses of the **[3]** key will toggle between these two starting sequences.

KEY 4

The Reaction Time results form the last run are displayed. The left window will indicate the lane number while the right window will indicate the RT for that lane. Press any key to advance to the next lane.

KEY 5

To recall the finishing order from the last run, press the **[5]** key. Both Pro Tree and the LED Displays will indicate the finishing order. The lane with a GREEN light is 1st place, the lane with the top YELLOW light is 2nd place, the lane with the middle YELLOW light is 3rdplace and the lane with the bottom YELLOW light is 4th place. The LED display will indicate 1, 2, 3, or 4 in both display windows above the lane number on the console.

KEY 6

To print a 4-lane timeslip, press the **[6]** key after each race. The Finishing Place, ET, RT, Redlight, and Total Time are printed for each lane. Total Time will be replaced with DNS or DNF for incomplete runs in each lane they occurred. To print multiple copies of the timeslip, tear off the timeslip and press the **[6]** key again to print another timeslip.

KEY 7

The Total Time (ET+RT) results form the last run are displayed. The left window will indicate the lane number while the right window will indicate the Total Time for that lane. Press any key to advance to the next lane.

KEY 8

To configure the printer port for different types of printers and additional line feeds to eject each timeslip, press the **[8]** key. The console displays **[null]** on the right LED Display then **[00]**. Null characters are used with older printers as a delay during carriage return line feeds when the printer does not contain character buffering. Nulls are also necessary when data is missing from the timeslip or shifted to the right or left out of place. Enter the number of nulls and press the **[#]** pound sign key. The console then prompts for the number of line feeds by dispaying **[LF]**, then **[00]**. The number of line feeds entered here are added to the end of each timeslip to eject the printed portion of the paper far enough to tear off theentire timeslip. Enter the number of line feeds desired and press the **[#]** pound sign key.

STATUS DISPLAY MESSAGES

During normal operation, messages will appear in the Status Display. These messages indicate status, mode of operation, or events occurring on the race track. Many of these messages are covered elsewhere in this manual and are alphabetically summarized in the following section as a reference:

SFSF

When entering Alignment Mode, this message will appear in sequence to indicate the alignment of the Track Sensors and Beam Emitters will be continuously monitored and the results displayed.

CodE

This message appears during the power-up sequence and indicates the software code level running in the RACEAMERICA timer.

End

This messages indicates all starting vehicles for that pair of lanes have crossed the finish line and the run is over for those two lanes.

Et x

The left display window will indicate which lane for the ET displayed in the right windows during a recall of the last run.

LF

This messages appears when configuring theprinter port for line feeds to be added to eject the printed portion of the timeslip.

null

This messgae appears when configuring the printer port for null characters to be added when older printers are connected which do not contain buffering capabilities.

Prod

This message appears during the power-up sequence and indicates the product number of the RACEAMERICA timer.

Sn

This message appears during the power-up sequence and indicates the serial number of the RACEAMERICA timer.

rt x

The left display window will indicate which lane for the RT displayed in the right windows during a recall of the last run.

totx

The left display window will indicate which lane for the Total Time displayed in the right windows during a recall of the last run.

MAINTENANCE REQUIREMENTS

MAINTENANCE

The 2400 Series TIMER S4 Console, Beam Emitters, and Track Sensors do not require any maintenance.

To insure uninterruptted operation on raceday, it is suggested to keep track of battery usage hours so as to have fully charged batteries. Plan to replace the alkaline AA cells in the Beam Emitters after about 60 hours use. If you are using rechargeable AA cells, recharge them each day. Low battery voltage (Emitters below 4.0V DC) will cause intermittent operation of the system resulting in intermittent cars detected at the starting line or the finish line as the batteries power weakens.

Beyond these items, you should not encounter any routine maintenance with the operation of your timing system.

SPARE PARTS

RACEAMERICA recommends a spare set emitter and sensor be available in the event of an unfortunate accident. Contact RACEMERICA for availability and pricing of spares items.